REMARKS

Reconsideration and allowance are requested.

Claims 23 has been amended to correct the antecedent basis issue raised by the Examiner. The dependency of and misspelling in claim 24 have been corrected. Withdrawal of the claim rejection under 35 U.S.C. §112, second paragraph is requested.

The inventors recognized that there is an inherent time delay between the time instant when a mobile user reports a current channel quality, e.g., in the form of a channel quality indicator (CQI), and the time instant that the base station schedules downlink transmission over a high speed shared channel to a mobile user. During this time delay, the interference may change dramatically. If the difference between the reported channel quality and the actual channel quality at the time of scheduling is large, the selected coding and modulation scheme may not be sufficiently robust to ensure transmission with a low enough error rate. If the data is received in error, the mobile radio requests retransmission which degrades system performance.

This difference between a reported CQI and the actual CQI at a scheduled high speed shared channel transmission is particularly problematic in adaptive antenna systems. An adaptive antenna system can change its beam characteristics in response to changes in the network. Because the base station can detect the direction of a mobile station, it can transmit dedicated information in an antenna beam towards the desired mobile station. By directing the signal just toward its recipient, the interference in the network can be substantially reduced. Adaptive antennas can significantly increase the data capacity in a cellular radio network.

The discrepancy between the reported channel quality and the instantaneous channel quality caused by scheduling different mobile users to receive transmissions over a shared radio channel may be traced in large part to a "flashlight effect." The flashlight effect is described in

detail in conjunction with Figures 1, 2, 3, and 4. In essence, the flashlight effect is intense interference detected by a mobile causing that mobile to report a low CQI for a short time period which results from the mobile being "flashed" by a brief downlink transmission to another scheduled mobile. But after that short flash, the mobile may very well have a very good channel quality leading to erroneous scheduling selections. The flashlight effect is a serious problem in fixed multi-beam systems, adaptive antenna systems, and transmit diversity systems.

The inventors devised technology to overcome the flashlight effect by selecting multiple mobile radios to receive a transmission over a shared radio channel during a predetermined transmission time interval. See for example Figure 6 in this application. The shared radio channel radio resources are allocated to the multiple mobile radios using a resource allocation scheme. An optimal coding and modulation scheme is preferably selected for each scheduled mobile radio to achieve an acceptable error rate. Information is transmitted over the shared radio channel to the multiple mobile radios using multiple antenna beams so that interference from the transmission appears as white additive Gaussian noise in time and in space in the cell. In this way, the flashlight effect caused by a single beam transmission over the shared channel that would detrimentally impact a mobile radio's detection of channel quality is avoided.

But splitting the resources amongst multiple beams during one TTI lowers the peak bit rate because the transmit power per beam largely impacts the achievable bit rate. The highest peak bit rate is achieved by allocating all transmit power resources to one beam in a cell. Yet, as just described above, a single beam allocation—without careful planning—causes the flashlight effect. But by carefully planning in space and/or in time which beam is used for transmission, the flashlight effect may be avoided. The flashlight effect may be avoided by carefully planning in space and/or in time which beam is used for transmission.

Another technique for avoiding the flashlight effect employs a beam transmission sequence order. Multiple mobile radios may be selected to receive a transmission over a shared radio channel using a beam transmission sequence order. Mobile users belonging to a selected beam may be scheduled. The beam selection is decided using a beam sequence number. Information is transmitted over the shared radio channel to each of the mobile radios in the cell following the beam transmission sequence order. Beam switching in accordance with the beam transmission sequence order occurs over multiple transmission time intervals so that interference from the transmission appears as white noise in time and in space.

Claims 1-6 stand rejected under 35 U.S.C. 103 for obviousness based on Parkvall and Nilsson. The rejection is respectfully traversed.

The Examiner admits that Parkvall fails to teach "transmitting information over the shared radio channel to the multiple mobile radios in the cell during the predetermined transmission time interval using multiple antenna beams so that interference from the transmission appears as white noise in time and in space." The Examiner relies on paragraphs 3, 34, and 35 in Nilsson.

But Nilsson does not even teach a base station. Its teachings are limited to the mobile terminal (see [0001]) which only has a single antenna (see Figures 2 and 6) and are directed to determining the type of interference affecting the communications quality. See abstract. There is no teaching of multiple antennas, multiple antenna beams being transmitted in a cell by a base station, transmitting information over a shared radio channel to multiple mobile radios in the cell during a predetermined transmission time interval using multiple antenna beams, or performing that kind of multiple antenna, multiple beam transmission over a shared radio channel to multiple radios so that interference from the transmission appears as white noise in time and in space.

Paragraph 0003 simply describes CDMA. Paragraphs 0034 and 0035 relate to a receiver (not a transmitter) in a mobile terminal (not a base station). The classifier 301 in the mobile terminal receiver detects either inter-cell interference, in which case the SNR is enhanced using a filter having a relatively large time constant , or intra-cell interference, in which case the SNR is enhanced using a filter having a relatively short time constant. None of this describes or even relates to what is recited in claim 1. The rejection should be withdrawn.

Claims 16-22 and 32-33 stand rejected under 35 U.S.C. 103 for obviousness based on Parkvall and Luschi. The rejection is respectfully traversed.

The Examiner contends that Parkvall describes multiple antennas associated with a cell for generating multiple antenna beams, each beam covering only a portion of the cell. Applicants have studied the sections of Parkvall identified by the Examiner and do not find this teaching in the particular text cited by the Examiner on Page 8 of the office action.

In any event, the Examiner admits that Parkvall does not teach "transmitting information stored in the one or more transmission buffers over the shared radio channel via the adaptive antenna array to the multiple mobile radios in the cell during the same predetermined transmission time interval using multiple antenna beams to spread out the interference caused by the transmission," as recited in claim 16.

The Luschi reference describes sending both control information over a first dedicated channel and further control information over a second dedicated channel. See abstract. Paragraph 0007 relied on by the Examiner for the above quoted claim features simply describes High Speed Downlink Packet Access with a downlink shared control channel (HCCH) to support the HS-DSCH. The Examiner relies on paragraph 0027 as teaching base station transmission buffers. But this text states that the buffering is UE (mobile terminal) buffering. Moreover, the

base station 2 in Luschi has only one transmission antenna 4 [0042]. So the combination of Parkvall and Luschi, even if it could be make for purposes of argument, fails to disclose transmitting buffered information over a shared radio channel via an adaptive antenna array to multiple mobile radios in the cell during the same predetermined transmission time interval using multiple antenna beams to spread out the interference caused by the shared radio channel transmission. Certainly, neither reference teaches that the claimed interference "from the transmission appears as white noise in time and in space in the cell," as recited in claim 17. The reference to page 5 lines 2-21 in Parkvall relates to a multi-cell simulation where the radio channel link is simply modeled using AWGN. There is no teaching that the base station transmits to multiple radios in one cell during the same interval using multiple beams to purposefully spread out interference caused by the shared radio channel transmission so that interference caused by the shared radio channel transmission appears as white noise in time and in space in the cell. The rejection should be withdrawn.

Claims 34 and 36-37 stand rejected under 35 U.S.C. 103 for obviousness based on Parkvall and Teo. The rejection is respectfully traversed.

The Examiner alleges that Figure 1 and page 2 of Parkvall discloses "selecting mobile radios to receive a transmission over a shared radio channel using a beam transmission sequence order" and "transmitting information over the shared radio channel using one beam to one or more mobile radios following the beam transmission sequence order for multiple predetermined time intervals," as recited in claim 34. Applicants have searched this Figure and text on page 2 and find no such teaching. Where is a beam transmission sequence order described? Scheduling transmissions over the downlink shared channel to different users is not what is claimed. Indeed, those scheduled transmissions may be accomplished using a single transmit antenna.

The Examiner admits that Parkvall lacks a teaching of "performing beam switching in accordance with the beam transmission sequence order after multiple transmission time intervals so that the flashlight effect is avoided." Dependent claims 15 and 31 also recite: "wherein the transmitting to the multiple mobile radios in the cell during the predetermined transmission time interval using multiple antenna beams prevents a flashlight effect from disrupting the channel quality detection performed by the mobile radios." This flashlight effect prevention feature is not taught in any of the applied references.

The Examiner alleges that Teo teaches this feature at paragraphs 0074 and 0079. Teo teaches an OFDM system in which a target mobile terminal requires a focused transmission beam to receive high data rate traffic information while the remainder of the mobile terminals must receive pilot and signaling information. To achieve both objectives, a base station generates a directional transmission beam for the data traffic information. In one embodiment, this directional beam also transmits the pilot and signaling information along with the data traffic information by rotating the beam within the coverage area. In another embodiment, the base station transmits a first directional transmission beam for the data traffic information required by the target mobile terminal and a second broad transmission beam for the pilot and signaling information required by the all of the mobile terminals. In another case, the base station transmits two directional transmissions beams: one beam for data traffic information and one rotating beam for pilot and signaling information.

The Examiner presumably is relying on Teo's rotational beam teachings as corresponding to a beam transmission sequence. Teo explains his rotational beam technology at 0034: "the BTS 50 transmits the directional wireless beam 52 in a rotating fashion, hereinafter referred to as a rotating beam, for the RF channel. In this implementation, each mobile terminal 54, 56 is

scheduled to be within the directional beam 52 for a respective time interval." Thus, as described in 0074 relied on by the Examiner, "each mobile terminal within the coverage area is being transmitted to during the proper time period." But paragraphs 0074 and 0079 do not disclose or suggest anything about the flashlight effect (described in detail in conjunction with Figures 1, 2, 3, and 4 of the instant application) or using a sequence of antenna beam transmissions specifically ordered to prevent that flashlight effect. Paragraph 0074 simply describes a rotating beam in one cell and Paragraph 0079 describes a rotating beam in two adjacent cells in which the timing of the two different beams in the different cells is coordinated so that they do not both focus on the same mobile at the same time in order to avoid the two beams interfering with each other. See Figure 9. How is this related to the flashlight effect?

Teo is not concerned with "performing beam switching in accordance with the beam transmission sequence order after multiple transmission time intervals so that the flashlight effect is avoided." Teo explains in the paragraph 0074 that "rather than assigning mobile terminals respective time intervals, the rotating beam simply sweeps through the coverage area of the BTS 50 at a rate that enables each mobile terminal to receive signaling and pilot channel bursts within the time the beam is passing the particular mobile terminal." Simply arbitrarily sweeping through the coverage area reveals that Teo has no appreciation of the flashlight problem.

Nor does the Examiner explain how or why the OFDM based system would have been used in the CDMA based system of Parkvall. Determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention. *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998). There must be some teaching, suggestion, or reason in the prior art to select particular elements, and to combine them as combined by the inventor. *Vulcan Engineering Co., Inc. v.*

Fata Aluminium, Inc., 278 F.3d 1366, 1372 (Fed. Cir. 2002). "The absence of such a suggestion to combine is dispositive in an obviousness determination." *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573, 1579 (Fed. Cir. 1997).

While a motivation to combine may be supplied by the knowledge and skill of those in the industry, such a motivation must be "clear and particular, and it must be supported by actual evidence." *Group One Ltd. v. Hallmark Cards, Inc.*, 407 F.3d 1297, 1304 (Fed. Cir. 2005) *(quoting Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1334 (Fed. Cir. 2002)). Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence. *In re Dembiczak,* 175 F.3d 994, 999 (Fed. Cir. 1999). The evidence required by the Federal Circuit is missing here, and at best, the rationale advanced by the Examiner is conclusory. There certainly is no teaching in Teo or Parkvall of preventing the flashlight effect problem. The rejections based on Parkvall and Teo should be withdrawn.

The Examiner rejects several dependent claims using the Walton reference. Walton describes scheduling terminals for data transmission on the downlink and/or uplink in a MIMO-OFDM system based on the spatial and/or frequency "signatures" of the terminals. But Walton does not try to prevent rapid interference change, but rather tries to ensure that scheduled users in the parallel OFDM transmissions have equal signal-to-noise ratios (SNRs).

The Examiner refers to col. 49, lines 14-24 of Walton as disclosing prevention of the flashlight effect:

> In yet another embodiment, the partial CSI comprises signal components in a matrix form (e.g., N_R x N_T complex entries for all transmit-receive antenna pairs) and the noise-and-interference components in matrix form (e.g., N_R x N_T complex entries). The transmitter unit may then properly combine the signal components and the noise-and-interference components for the appropriate transmit-receive antenna pairs to derive the quality of each

> transmission channel used for data transmission (e.g., the post-processed SNR for each transmitted data stream, as received at the receiver unit).

No where in this text is the flashlight effect problem described or a solution taught. Rather, this text simply describes combining signal, noise, and interference for transmit-receive antenna pairs to determine the SNR for each transmitted data stream as received at the receiver unit.

The Federal Circuit *requires* consideration of the problem confronted by the inventor in determining whether it would have been obvious to combine references in order to solve that problem. *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 935 (Fed. Cir. 1990). That consideration is lacking in Parkvall, Nilsson, Luschi, Teo, and Walton. Indeed, the Examiner must show reasons why one of ordinary skill in the art, confronted with the same problem as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed. See *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). Absent that recognition, it is clear that the Examiner's attempted combination lacks the requisite motivation. The *Rouffet* Court warned against "rejecting patents solely by finding prior art corollaries for the claimed elements" because that would "permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art." *In re Rouffet*, 149 F.3d at 1357. That approach was found by the Federal Circuit to be "an illogical and inappropriate process by which to determine patentability." *Sensonics v. Aerosonic Corp.*, 85 F.3d 1566, 1570 (Fed. Cir. 1996). Where is the problem of the flashlight effect, as explained above, described in any of the applied references? Where do any of the applied references describe a solution to the flashlight effect problem?

The obviousness rejections are improper and must be withdrawn. Accordingly, the application is in condition for allowance. An early notice to that effect is respectfully requested.

Respectfully submitted,

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